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NESTS OF *OSMIA MARGINIPENNIS* CRESSON WITH A DESCRIPTION OF THE FEMALE (HYMENOPTERA: MEGACHILIDAE)

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Osmia marginipennis Cresson is one of the five species placed in *Cephalosmia,* a subgenus of bees that is restricted to North America. The biology of three species of *Cephalosmia* is partly known and all build nests in existing burrows in wood (Rust, 1974). In mid June of 1978 my sons and I found several nests of *Osmia marginipennis* built in cracks in rock outcroppings on a mountain ridge near Logan, Utah. Previously, the biology of this bee was unknown, and the females were indistinguishable from those of *O. californica* Cresson.

This paper describes the distinctive features of females and the construction and provisions of their nests and their nest associates.

Female.—Black, some specimens with metallic blue terga, wings light brown, veins dark, medial area of marginal cell and apical margin of forewing darker. Pubescence black except for mixture of whitish hairs along inner orbits of compound eyes and behind vertex; scutum ringed by pale hair but hair entirely black medially; white hair tufts behind pronotal lobe; scutellum, metanotum, propodeum laterally with white hair; tergum I entirely white dorsally, apically. Punctation close, contiguous over most of body; pits separated by about their diameter on most of clypeus and posterior edge of vertex; pits on medial area of scutum, tegula more widely separated; propodeal enclosure shagreen; tergum I closely pitted, II–V with shallow separate micropits, pits progressively more numerous posteriorly; terga with narrow impunctate apical bands; tergum shagreen, dull. Mandibles as long as distance between base of compound eyes, 4-toothed, basal 2 teeth similar, 3rd triangular, 4th elongate, acute, apical tooth twice distance from basal teeth as these teeth are from one another; emargination between mandibular teeth progressively deeper from base to apex; folded mouthparts extending between forecoxa; head as long as broad; apical margin of clypeus truncately produced medially, truncation sometimes concave, apical part of clypeus bent down in profile; distance between median ocellus and lateral ocellus equal to distance between lateral ocelli; distance between lateral ocelli and compound eye equal to distance between lateral ocelli; distance between lateral ocelli ¾ distance from lateral ocellus to margin of

vertex behind ocelli; distance from compound eye to apical margin of vertex twice distance from lateral ocelli to compound eye; hind basitarsus $^1/_5$ as wide as long, uniformly spiculate; scutum slightly wider than long, sternum VI depressed, rimmed apically; width of tergum III about 3× its length.

Females of *O. marginipennis* can be separated from those of *O. californica* by the all white hair pattern on tergum I, the white hair pattern on the scutum, the large area medially on the scutum that is less pitted, the black head and thorax and their larger size, 10–16 mm.

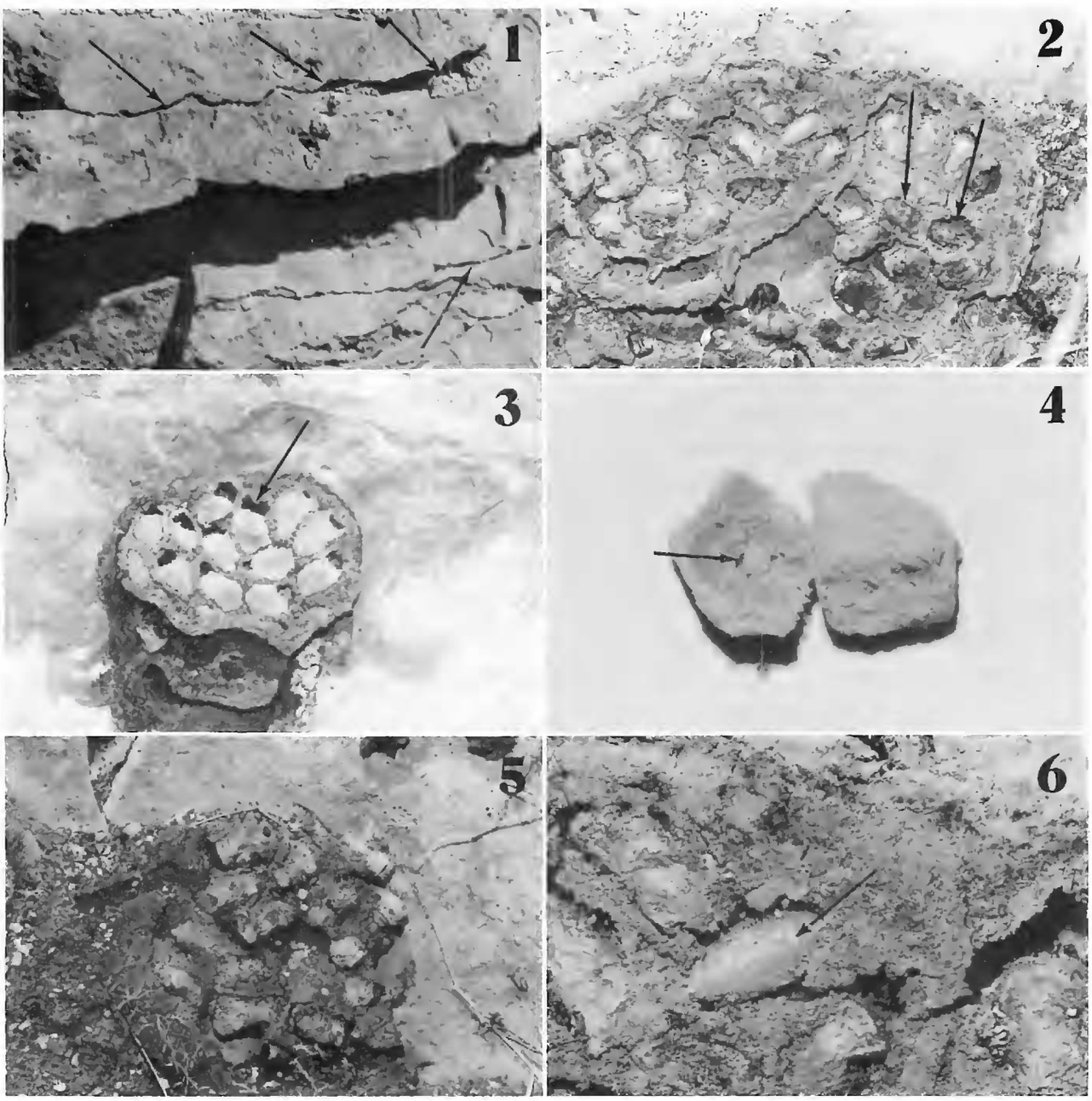
Rust (1974) listed *Osmia pascoensis* Cockerell, 1897 as a synonym of *O. californica*. However, Cockerell's name is a synonym of *O. marginipennis* Cresson, 1878 based on material in the U.S. National Museum collection.

Nesting site.—A west-facing exposed ridge with numerous rock outcroppings, scattered flat stones, and stunted sagebrush occurs near the summit of Wellsville Mountain, 2500 m (8000′) Cache County, Utah. There, nests of *O. marginipennis* were made in vertical and horizontal cracks in rock outcropping (Fig. 1). Most of the large broken stones in the outcroppings were loose, and the nests were easy to remove or mark. Beneath stones and in smaller cracks in rock outcroppings mud nests of *Osmia tanneri* Sandhouse and masticated leaf nests of *Anthocopa elongata* (Michener) and *A. abjecta* (Cresson) (Parker, 1975a, b, 1977) were found at this same site.

Nest construction.—All nests were found in cracks 6–14 mm wide (Fig. 1). Six completed nests were found with an average of 12.3 cells/nest and a range of 13–23 cells. Most nests were begun in the far end of a crack and extended toward the front (Fig. 2). The arrangement of the cells appeared rather random, as they were made by partitioning the crack into chambers. The surfaces of the rock around the crack and walls of old cells served as portions of the sides of new cells. Because the rock surface was irregular, the width and height of the cells varied considerably, although the nests were only one cell deep.

Cell walls were made from a mixture of mud and masticated plant parts and were 1–2 mm thick. Some nests were surrounded with additional mud walls on the outer surfaces and these layers were 3–10 mm thick. Finished cells were plugged with a circular pattern of nest-building material, but the outside of the plug was smoothed by additional layers. Cells were between 7–9 mm wide and 13–16 mm long.

Provisions.—The pollen-nectar stores were packed tightly against the cell walls from the end to near the cell cap. However, in all cells there was a space between the pollen and cell plug (Fig. 3). Nearly all of the pollen came from composites (99%). The sizes of the pollen grains indicate that at least 3 kinds of plants were visited. The host egg was placed in a small chamber inside of the provisions (Fig. 4) as is characteristic for species of *Cephalosmia*.



Figs. 1–6. Fig. 1. Cracks (arrows) in a rock outcropping where nests of *Osmia marginipennis* were found. Fig. 2. Old nests of *O. marginipennis*. The cells below the arrows contained adults of both *Stelis* and *Osmia*. The nests above the arrows contained prepupal larvae of hosts and parasites. The arrows mark cocoons of the parasite *Stelis callura*. Fig. 3. A newly constructed nest of *O. marginipennis* in progress of being finished. Note space at end of provisions (arrow). Fig. 4. A pollen ball opened to illustrate the central egg chamber (arrow), now almost filled by a young larvae. Fig. 5. An old nest of *O. marginipennis*. The cells contained prepupal larvae. Note the partially destroyed cell walls. Fig. 6. Cells in a nest of *O. marginipennis*. One (arrow) contained the coarctate larva of the meloid beetle, *Tricrania stansburyi*.

Feces.—Most fecal pellets were uniformly shaped, 1 mm long, slightly bent, round in cross section, yellowish brown and without impressed lines. The fecal material was outside of the cocoon at the bottom or sides of the cell.

Cocoon.—Larvae of *O. marginipennis,* like other species of *Cephalosmia,* spun a 3-layered cocoon. The first layer in *O. marginipennis* was spun thickly and closely against the cell walls, lining the entire cell; at the top of the cell a concentric network of thin, ribbon-like silk bands was formed that held the cocoon securely in place. This layer was light when first spun, but it darkened with age. The second layer was barrel-shaped, thick, and reddish brown. At the top of the barrel was the characteristic nipple that is found on most cocoons of *Osmia.* The nipple was 1 mm high and made of coarse mat-like strands of brown silk, but on the inner surface and beneath the nipple the second layer was sealed. The third layer consisted of a thin, opaque, varnish-like material, probably excreted from the anus. Cocoons with males were 10–12 mm long, and those with females were 13–14 mm long.

Overwintering.—In June of 1978, 3 types of nests were found: (1) Those in which adults or parasites had emerged or were alive and still within their cocoons; (2) those with old cocoons (nests with cell walls partially destroyed and discolored cocoons) containing prepupal larvae; (3) those with newly provisioned cells containing eggs or young larvae. The old cocoons containing prepupal larvae were kept in the laboratory at room temperature and in September, 1978, they changed to adults but did not exit the cocoons. Apparently these adults would exit the following spring. The newly provisioned nests were marked and in October 1978, these cells contained only prepupal larvae. If this type of overwintering pattern is usual for the species, then larvae of *O. marginipennis* have a 2 year developmental cycle. A related species, *Osmia californica,* has a similar but facultative pattern of overwintering.

Sex ratio.—Twenty cells contained females and 35 contained males (1♀:1.75♂).

Parasites.—Three parasite species were found in cells or cocoons of *O. marginipennis.* The most common parasite (10 cells) was a bee, the megachilid, *Stelis callura* Cockerell. These parasitized cells were easily distinguished by the smaller, smooth, nippled cocoons (Fig. 2, arrows) in them. The *Stelis* had a similar overwintering pattern as did the host. This parasite rearing is the first host association for *Stelis callura.* Seven old cells contained coarctate larvae of the common meloid, *Tricrania stansburyi* Haldeman (Fig. 6). These beetles changed to the adult stage in September of 1978. Two cells contained larvae of the pteromalid, *Pteromalus venustus* Walker. These wasps emerged during the summer and reparasitized 30 additional cells held in a petri dish. Some female bees had the hypopial stages of the

mite, *Chaetodactylus* sp. (near *anthidii* Oudemans), stuck to the propodeum and abdomen.

Discussion

The nest building material used by *O. marginipennis* is similar to that used by *O. californica*. Both species incorporate mud with the plant parts, whereas other biologically known *Cephalosmia* do not use mud in their nesting activities. Unlike *O. californica, O. marginipennis* does not fill the cell entirely with its provision. Also, *O. marginipennis* is the only member of this subgenus that is known to nest in places other than wood. The varied pattern of overwintering as either larvae or adults is found in populations of *O. californica* also.

Acknowlegments

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